

## Earth's Paleobiosphere

**ES-6 The student will demonstrate an understanding of the dynamic relationship between Earth's conditions over geologic time and the diversity of its organisms.**

**ES-6.5 Infer explanations concerning the age of the universe and the age of Earth on the basis of scientific evidence.**

**Taxonomy level:** 2.5-B Understand Conceptual Knowledge

**Previous/future knowledge:** Students have not been introduced to the concept in this indicator in any previous grade.

**It is essential for students to know that**

- Scientists collect data using various types of telescopes and instruments to detect changes that are going on out in the universe.
  - This study, called *cosmology*, not only studies the universe as it is, but also forms models and theories concerning its origin and age.
  - Students should study the scientific evidence and use that evidence to make inferred explanations about the age of the universe.
- Scientists are collecting and analyzing data that are used to develop theories about the age of Earth.
  - Radiometric dating has determined the age of the oldest rocks on Earth at present time but the rocks that form Earth's crust have been eroded over time.
  - Meteorites and moon rocks have also been studied for evidence of age.
  - Students should study the scientific evidence and use that evidence to make inferred explanations about the age of Earth.

**It is not essential for students to know** the details and mathematics (e.g. use of the Hubble constant) of all the scientific evidence; but a general understanding of what scientists have discovered, used, and analyzed in order to come up with a determination of the age of the universe and Earth is appropriate.

### **Assessment Guidelines:**

The objective of this indicator is to *infer* the age of the universe and Earth; therefore, the primary focus of assessment should be to draw scientifically based conclusions/explanations based on evidence gathered by scientists.

In addition to infer appropriate assessments may require students to:

- *summarize* methods that scientists use to gather information from across the universe or from on Earth to determine age;
- *recall* the purpose of the field of science called cosmology; or
- *identify* the age of the universe and the Earth as determined by scientists.